15003

OTHER ALUMINUM

Subvalent Disproportionation of Aluminum Monochloride

A nonelectrolytic method for primary aluminum production based on the disproportionation was investigated in three laboratory tests. The process was based on aluminum monochloride (AlCl) formation by reaction of alumina and carbon in a molten fluoride/chloride salt. No aluminum metal was produced but the presence of aluminum carbide indicates that the desired reactions probably occurred and the aluminum reacted with the graphite container.

AD-125 Electrorefining

Electrorefining offers the capability of producing primary grade metal from any scrap source as well as producing 99.99+% metal from poor grade primary or scrap. Electrorefining in the past has consumed power equal to or greater than required to produce primary metal. Theoretically electrorefining requires only tenths of kwh/lb power consumption, and the remaining is all in IR losses. If the large IR loses could be overcome without a loss in purity, then electrorefining would be quite attractive.

One potential for overcoming the IR losses is to utilize TiB_2 electrodes. A TiB_2 anode, cathode or both could be utilized to reduce the IR drop that could result in electrorefining aluminum for ≤ 2 kwh/lb. If the aluminum alloy to be refined wets TiB_2, then a cathode can be placed close to the anode to refine aluminum at low IR drops. A few lab scale experiments were performed which determined that some aluminum alloys do wet TiB_2 and that high purity aluminum could be electrorefined at low power consumptions. It was not determined if the mass transfer of wetting was sufficient to support commercial operations. There was also some evidence that magnesium prevent wetting of the aluminum alloys on TiB_2. The limited lab scale results showed sufficient promise to further investigate the concept in 1984 with a 2 ka demonstration.